MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday March 14, 1995.

Action Items:

94. Provide a detailed (high fidelity) analysis of scatter in the scan cavity. The results would determine the need for PF near field scatter measurements vs scan angle. Assigned to Guenther 8/23/94 Preliminary results due 10/15/94. Final due 2/28/95.

108. Prepare a report addressing the status of the MODIS Reliability Program. Reliability elements will include: FMEA, Worst Case, CIL, Reliability Assessment and Parts Device Stress Analysis and Trend Analysis. Assigned to Silva 1/ 3/94. Due 1/17/95

109. Determine if there are any technical problems associated with the different instrument orientations with respect to gravity when testing MODIS at SBRC versus testing MODIS at the spacecraft integrator. Assigned to Roberto 1/10/95. Due 2/13/95 CLOSED 2/17/95

110. Write up the disposition of the reduced -5°C torque margin on the scan mirror, given increasing torque requirement of test bearings. If the decision is to accept as is, document the rationale. Assigned to Roberto 1/17/95. Due 1/31/95

111. Recommend an optical design for the diffuser screen. Assigned to Waluschka 1/31/95. Due 2/28/95

112. Analyze the ScMA optical design. Assigned to Waluschka 1/31/95. Due 2/ 7/95

Attendees:

✓ Richard Weber	Bruce Guenther	✓ Larissa Graziani
✓ John Bauernschub	✓ George Daelemans	✓ Bob Martineau
Rosemary Vail	Patricia Weir	✓ Bob Silva
Lisa Shears	Mitch Davis	✓ Robert Kiwak
✓ Mike Roberto	Ken Anderson	✓ Harvey Safren
Nelson Ferragut	Rick Sabatino	✓ Ed Knight
✓ Gene Waluschka	✓ Cherie Congedo	✓ Harry Montgomery
✓ Bill Barnes	✓ Jose Florez	Marvin Maxwell
✓ Les Thompson	Gerry Godden	✓ Bill Mocarsky
John Bolton	✓ Sal Cicchelli	✓ Helen Phillips
Pat Delosa		

The following items were distributed:

1) Weekly Status Report #180
2) SBRC Memos submission from week #172
3) Minutes of the previous team meeting

MODIS Technical Weekly 17 March 95

Sent out 3/17/95 at about 3:55 PM to MODIS.REVIEW

1. Summary

The science team meeting is May 3 to 5. Action items from the last meeting should be completed by the end of this month.

As Jose Florez pointed out, once SBRC made up the extender boards and gained access to locations on the electronics boards, SBRC was able to quickly determine and correct electronics problems. It is important that extender boards be available for the PFM. The FIFO swap problem has not been solved, but the electronics work with all focal planes powered. At this time, it appears additional work on the Main Electronics Module (MEM) will be deferred until after thermal vacuum testing.

Now that the electronics problems have been beaten down, ambient system performance testing has resumed.

While at SBRC, Mitch Davis attended a meeting regarding thermal issues for the electronic components in thermal vacuum testing. Mitch has provided highlights of this important meeting as well as three action items for Jose Florez regarding power dissipation for MEM components.

George Daelemans spent a few days at SBRC in early March. George reviewed the plan for thermal vacuum testing of the EM and provided comments. He is recommending that contamination heaters for the rad cooler be installed and tested during the EM T/V testing. George reviewed the MODIS Calibration Chamber (MCC) setup and recommended that Larissa Graziani be at SBRC before chamber pumpdown to assure proper locations of contamination monitoring equipment. He met with Ron Chu, the new thermal engineer.

Eugene Waluschka has sent Jim Young a description of his suggested design for the hole pattern for the 8.5% solar diffuser attenuation screen. This includes the Code V sequence file and diagrams of ray patterns.

Dave LaKomski of Hughes EOS has done analyses to predict component temperatures of the MODIS electronics in thermal vacuum. Based on these analyses, it is expected that several components will be local spot thermally bonded before EM thermal vacuum testing.

The cryogenic quartz crystal microbalance (CQCM) arrived at SBRC on March 10. Carl Brazier of SBRC QA took care of the paper work and David Jones delivered the CQCM to John Wills at the MODIS Calibration Chamber (MCC).

2. Systems Integration and Test (Tom Koch)

A few highlights from Systems Integration and Test Coordination Meeting, Tom Koch, March 13, 1995 (editor's notes in parentheses):

a) missing data codes corrected (as discussed the March 10 report, for some transitions, the LSB is occasionally wrong).

b) 0.5 to 2 count RMS noise baseline established (peak to peak random noise is 1 to 3 counts).b) system transfer function measured with ramp input (this was for a ramp input to the A/D for the SAM).

c) system noise measured at ambient (noise was looked at with focal planes blocked or disconnected).

d) gain and offset tables established for ambient testing.

e) polarization insensitivity retested (0 and 360 degrees did not match, cosine squared response not seen in one band, data being analyzed by GSFC science personnel)

f) near field response measurements in process (adjustments made to minimize any scatter due to the ScMA).

g) the vacuum leak that halted the space view source (SVS) and radiative cooler Space Background Simulator (SBS) performance check corrected. A defective nadir panel LN2 line was replaced.

h) the Integration and alignment collimator has been moved to the MODIS Calibration Chamber (MCC).

3. MODIS Electronics Meeting regarding Thermal Issues (Mitch Davis)

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email from Mitch on 3/14/95
SBRC held a meeting to discuss the thermal issue with the MODIS Electronics on March 14, 1995. SBRC generated a list of action items which I will not repeat here. The handout of the analysis results is attached. Instead, I will summarize the meeting with several highlight bullets.

o Ed Clement generated a table showing the revised actual power dissipation which was compared to the values used in the revised thermal analysis. In each case the "analysis" power numbers where larger than the revised "actual" power numbers.

BOX	Ed's revised actual power (W)	revised thermal analysis (W)
MEM	77.78	92
SAM	27.69	30
FAM	14.27*	16

* the CLAM power (5.5W) must be subtracted from the FAM power.

o The current plan is to go to 275 ° K, then to 295 ° K and if possible to go to a maximum upper limit of 315 ° K. The revised thermal analysis uses a 30 ° C Mainframe boundary temperature. Therefore, the maximum component (@ 315K) temperature will be ~10 ° higher than the analysis.

o A critical action item was to clarify the part numbers to which side of the board. There are some cases where identical part numbers were used on a compound board assembly. This could definitely modify the analysis results.

o There is a major change from the original design of the FAM. The divider plates between cards were not installed in the FAM. This is the first time I found out about this change.

o The CLAM mounting may have to be changed. There was a critical action item to verify that the CLAM is properly mounted for heat conduction.

o All temperature modification/corrections to the electronics MUST BE completed by the end of Friday. MODIS is planned to be moved Friday which would make it extremely difficult to pull boards after Friday.

I asked Jose Florez to verify the following three "actions" prior to Friday.

1. Verify that the correct power for the "26C31". The "Timing Generator" uses several 26C31 with the power dissipation at 0.15W. Where the "Single Board Computer" uses the same part but at a power dissipation at 0.60W. I would guess that at least some of the "Timing Generator" parts are switching faster than the "Timing Generator" part.

2. Verify that some operational modes (modes with minimal 5V load which increases the analog voltages.) do not product a worst case on some of the MEM cards, (in particular the "Digital Telemetry" board).

3. Verify that the "Analog Telemetry" board does not have a hot voltage regulator in it similarly to all the other analog boards.

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4. Week of March 6th to 9th Trip Report (George Daelemans)

email from George on 3/16/95:

Met with Ron Choo the new thermal engineer, replacing Paul. He seems willing to do his best to see the instrument through to proto flight delivery. He will be reluctant to spent the amount of overtime that Paul regularly put in but I do not believe that will be a problem after the EM test.

My activities at SBRC centered on reviewing the test plan and getting my comments into the procedures. Highlights include reordering the cool portion of the radiometric testing to precede the hot portion. This is because of the uncertainty how high the hot spots are within the electronics and how finite the electronics life might be, so putting the high stress portion of the test at the end seemed wise. Subsequent to my return the high temperature has fluctuated from 320K down to 295K and is currently at 305K. GSFC will be providing the test predictions for the EM test for the two balance temperatures and what the corresponding SBS temperature should be. The outputs from GSFC will be in table form with SBRC telemetry designator vs SINDA predict and the hardware temperature limits. SBRC will also perform predictions; however, their model will not have chamber couplings derived from a radiation model (e.g. NEVADA or TRASYS). Dave LaKomski of EOS did the original piece part thermal analysis, and will do a review with measured powers for a current assessment of the hot points. His preliminary finding was about 50 pieces needed some heat sinking for the reliability of the EM unit to pass through EM testing. We, GSFC, need to obtain from SBRC some plan to insure that this WILL NOT be repeated for the protoflight unit card level thermal design. I would recommend that 100% IR imaging in air be required for all cards and that all unique card layouts be subject to vacuum IR imaging. This will insure that the thermal design is good and provide a "thermal workmanship" check against the ever changing personnel situation at SBRC.

I also pushed the inclusion of using the rad cooler contamination heaters to be used for a portion of the test to demonstrate expected orbital performance (sans solar scatter of course). This is apparently difficult due to the programming nature of OASIS and the low duty cycles needed to simulate Albedo and earth IR heat

loads. Some of the remaining barbarians have forgotten that the unit level test was compromised by the cryo SBS design shortcomings. This issue may still be need working.

I also reviewed the chamber set up, and got a preliminary briefing how to operate the data system. The engineer responsible for assembling the software in the data logging package was also leaving SBRC and was training a replacement from EOS El Segundo. I did not see any of the active contamination monitoring equipment in place. Suggest that Larissa go out a week before pump down for noting that sensors are correctly installed (note position is important for correct monitoring).

5. NASA Systems Telecon (Tom Pagano)

The following was provided by Tom Pagano in an email message on March 13:

Barnes. Reviews of our detailed test procedures were sent. Should get those soon. We should change BCS in equal radiance increments; comment doesn't make sense since we'd have to run it 36 times. The way you have it is OK.

Neil. Correlated noise is no longer with us. It hasn't reappeared. We believe the problem is gone. The A/D converters had a common problem of missing codes from 1 bit to 3 bits. In all cases, the ground impedance was reduced by better grounds. Now we have eliminated the missing codes, but we do have irregular bin sizes. Now there are a couple of transitions showing an asymmetry. E.g. where we might have 200 bins of one code, for other transitions we'd get 300 or 100. We've also put conformal coating on some of the components of the SAM card. On the chamber side, they are essentially ready to receive the MODIS.

Barnes. Was the conformal coating for thermal purposes?

Neil. Yes.

Roberto. For occasional missing code, do you know what the fix is for protoflight?

Neil. Yes. Improvement in grounding and reference supplies improves it. A different layout of the PF will improve the grounding and there are hooks in there to make changes. I'll be working with electronics to get a memo out.

Tom. Ready for ambient but not for T/V. Still need to test the rad cooler SVS.

George. Did you find leak?

Tom. Yes, it was a nadir panel LN2 line.

Tom/Jim. There was a half moon on the return beam. We found today that the slit was asymmetrical when viewed from the mirror. We realigned it and it went away.

Jim. We will place at the source slit a smooth surface to limit energy retroreflected to the ScMA slit to prevent another opportunity of imaging to the MODIS FPA.

Barnes. Blackening around slit?

Jim. Yes it is black now, but if we assume we had a 6% reflectance in the slit region and if it were perfectly diffuser, then we would have had an attenuation of 5 E-5 for that path. That would be great, on the other hand, if it were 6% black and specular, that would give us a return of 1.2E-2. We are sure we're not specular, but we're not diffuser. We will place in the vicinity of the slit a black which is maybe no better than what we have now, but we will optically polish anodized aluminum and insert it in a wedge.

Tom. Obtained data. 1e-5 noise level, 1e-4 step at intermediate field stop between primary and secondary, 1e-3 ghosting, from 1e-3 to 1e-2 we get a wing that fits a linear slope on a log-log scale with a harvey shack exponent of -2, and then we have the main pixel.

Jim. The slope we're seeing is higher than what we've seen looking at the aft optics scatter data.

Barnes. Do you think the ScMA is all right?

Jim. We can't say that conclusively.

Tom. We should know by the end of the week.

Barnes. Are you saturated when you collect data?

Jim. Yes, but we have normalized signal acquisitions.

Tom. We use calibrated nd filters to tell us where we are when we are saturated.

Tom. We are discussing the possibility of reducing ambient BCS testing since it is difficult to do absolute radiometry with c-sub in place.

Weber. Will this affect our ability to measure response vs scan angle?

Tom. This should not affect scatter or response vs scan angle measurements, since those are relative measurements.

Ed. Would you use the original plan for spectral and spatial tests in ambient?

Tom. Correct.

Jim. Using the method of least squares to fit the spectral calibration data.

Harry. We'd be interested in how you make that work

Weber. Temperature in thermal vac. Not going very hot.

Tom. Discussion with R. Choo and Ed Schultz. We may be able to perform the tests at 275 to 295 and use one day at the end of tests for an elevated temperature.

Weber. 3 temperatures. 315 at the end?

Tom. Correct, but I'd like not to look at this as part of the procedure, but as a special test.

George. Any hard numbers from Ron on Electronics?

Tom. No. I'll get in touch with him today.

George. Elevated temperature should be based on what we're running internally rather than being afraid. Values theoretically from Paul were based on instrument at 315K. Took into account what environment would be seen. A lot higher than what we seen from Lakomski's analysis. I'm getting at that I'm not convinced we've exhausted the hot spot problem and use a high temperature if we can do spot repairs. This is an EM we should be getting all that we need for all parties based on some numbers.

Tom. PF has different heat sinking than EM.

George. Difference between operating for 4 days than several months. I'd make top end temperature of 305K based on what I've seen up through now. Consistent with PAR requirements.

Barnes. Third point at the end sounds good since if you broke you could quit.

George. How long would you need?

Tom. Approximately 1 extra day.

Ed. Any more polarization measurements?

Tom. The results were worse. 0#161# and 360#161# did not match. Slope was different. Band 3 didn't show a significant cosine squared dependence.

Ed. How many scan angles?

Tom. One. Nadir.

Ed. We've crunched all the data on polarization. We're looking at parts of it and intending to get as much done by the end of the week. Expecting near field response data. We will include our results in a report. One of the things we're seeing is a banana shape in the track direction. Detectors in track are higher in polarization. No know reason why.

Ed. T/V in about 4 weeks?

Tom. May be sooner, but that's about right.

Tim. We need to send the data to a different machine.

6. Bob Martineau (Focal Planes)

a) S/MWIR PFM FPA tests are complete

b) SBRC got the PFM filters from Barr Associates and SBRC now has all PFM filters.

c) Filter bezel due March 17.

d) LWIR PFM testing complete w/o bezel filter. Filter bezel assembly due March 24. Delivery of FPA is due March 29.

e) Testing has started for Flight Model 1 (F1) and F2 VIS and NIR Sensor Chip Assemblies (SCAs).

f) For the S/MWIR F1 and F2, three initial sets have been kitted (determined how the subarrays would fit together and perform) and inspected for diamond point turning. The first SCAs are scheduled for tests in April. The diamond point turning is done to take off material from the back of the chip to get the proper thickness.

g) The LWIR PV detectors for F1 and F2 are in diamond point turning. The first SCAs will be ready for testing in March.

h) For the flight packaging buildup, the second lot of 8 motherboards for F1 and F2 will be complete next week. The build of pedestal assemblies for F1 and F2 are on plan. Six more W1 cables are expected.

7. Class I and Class II Configuration Change Requests

Our engineering team is asked to evaluate change requests that are not obviously class I or class II. A class I change request affects form, fit, function, performance, cost, schedule, reliability, and/or safety at the GSFC requirements level. A class I change request requires GSFC approval. Examples of approval include a waiver, deviation, spec relief, etc. A class II change is any change which is not class I. GSFC approval of a class II change is not required; however, GSFC must concur that the change request is class II.

Mike Roberto
17 March 95